



U.S. Department of Energy  
**Office of River Protection**  
P.O. Box 450, MSIN H6-60  
Richland, Washington 99352

04-ESA-0213

04-WTP-224

SEP 28 2004

Mr. J. P. Henschel, Project Director  
Bechtel National, Inc.  
2435 Stevens Center  
Richland, Washington 99352

Dear Mr. Henschel:

CONTRACT NO. DE-AC27-01RV14136 – APPROVAL OF AUTHORIZATION BASIS  
AMENDMENT REQUEST (ABAR) 24590-WTP-SE-ENS-04-0105, REVISION 0, *ADDITION  
OF A PREVENTATIVE CONTROL ASSOCIATED WITH PLUGGING OF THE LAW  
CATALYTIC OXIDIZER/REDUCER UNIT*

Reference: BNI letter from J. P. Henschel to R. J. Schepens, ORP, "Transmittal for Approval:  
Authorization Basis Amendment Request 24590-WTP-SE-ENS-04-0105,  
Revision 0, 'Safety Evaluation for Addition of a Preventative Control Associated  
with Plugging of the LAW Catalytic Oxidizer/Reducer Unit'," CCN: 094053,  
dated September 13, 2004.

This letter approves the subject ABAR that Bechtel National, Inc. provided to the U.S.  
Department of Energy, Office of River Protection (ORP) on September 13, 2004 (Reference).  
The ABAR proposed to change the manual maintenance bypass valves for the chemical cleanup  
equipment in the Secondary Offgas System (catalytic oxidizer/reducer unit skid) to automatic  
valves actuated on high differential pressure across the equipment/skid for the Low Activity  
Waste (LAW) facility.

ORP review of the changes proposed in the subject ABAR and of the changes to the Preliminary  
Safety Analysis Report (PSAR), Revision 1, is summarized in the attached Safety Evaluation  
Report (SER). Based upon the information in the Reference and the attached SER, the changes  
are acceptable and there is reasonable assurance that the health and safety of the public, the  
workers, and the environment will not be adversely affected by those changes, and that they  
comply with applicable laws, regulations, and River Protection Project Waste Treatment and  
Immobilization Plant (WTP) contractual requirements.

The proposed changes to the LAW PSAR were reviewed for consistency with the changes to the  
facility design proposed in the ABAR. The approved proposed changes in this ABAR will  
ultimately serve to update the PSAR. While the proposed changes to the LAW PSAR, as  
modified, were determined to be consistent with the proposed changes to the facility design as  
described in the safety evaluation contained in the ABAR, final review of the proposed changes  
to the PSAR cannot be made until Chapter 2 of the PSAR is available for review. As a result,  
this SER provides final approval for the general design changes as described in the ABAR, but

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only interim approval of the proposed specific changes to the LAW PSAR. Final review and approval of the detailed PSAR changes will be made at the time of PSAR update when revisions to Chapter 2 are provided.

This amendment is effective immediately and shall be fully implemented within 30 days. If you have any questions, please contact me, or your staff may contact Dr. Walter J. Pasciak, WTP Safety Authorization Basis Team, (509) 373-9189.

Sincerely,

  
Roy J. Schepens  
Manager

WTP:WJP

Attachment

cc w/attach:  
M. T. Sautman, DNFSB  
J. M. Eller, PAC

**Safety Evaluation Report (SER)  
of Proposed Authorization Basis Amendment Request (ABAR)  
24590-WTP-SE-ENS-04-0105, Revision 0  
of Low Activity Waste (LAW) Facility Changes  
for the River Protection Project Waste Treatment and Immobilization Plant (WTP)**

## **1.0 INTRODUCTION**

This SER documents the U.S. Department of Energy, Office of River Protection (ORP) evaluation of changes proposed by Bechtel National, Inc. (the Contractor) involving the change of the manual maintenance bypass valves for the chemical cleanup equipment in the Secondary Offgas System (catalytic oxidizer/reducer unit skid) to automatic valves actuated on high differential pressure across the equipment/skid.

## **2.0 BACKGROUND**

The WTP authorization basis is the composite of information provided by a Contractor in response to radiological, nuclear, and process safety requirements that is the basis on which ORP grants permission to perform regulated activities. The authorization basis includes that information requested by the Contractor for inclusion in the authorization basis and subsequently accepted by ORP. The Preliminary Safety Analysis Report (PSAR) describes the analyzed safety basis for the facility, demonstrates that the facility will perform and be operated such that the radiological, nuclear, and process safety requirements are met, and demonstrates adequate protection of the public, workers, and the environment.

The PSAR is based on the preliminary design of the facilities and is part of the authorization basis for WTP construction. ORP authorized construction<sup>1</sup> of the LAW facility based on the facility safety basis documented in the PSAR. Under the requirements of RL/REG-97-13, Revision 10,<sup>2</sup> the Contractor is required to update the PSAR every two years. The amendment request<sup>3</sup> submitted by the Contractor proposes changes to the PSAR that will be incorporated in the PSAR during the next biennial update. This SER documents ORP's evaluation of the facility changes proposed in the reference ABAR, and also evaluates the detailed changes to the PSAR. The enclosed SER provides final approval for the facility design changes as described in the ABAR, but only interim approval of the proposed specific changes to the LAW PSAR. Final review and approval of the specific PSAR changes will be made at the time of PSAR update when revisions to Chapter 2 are provided.

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<sup>1</sup> ORP letter from R. J. Schepens to R. F. Naventi, BNI, "U.S. Department of Energy (DOE) Notice to Proceed with Construction Activities," 02-OSR-0517, dated November 13, 2002.

<sup>2</sup> Office of River Protection Position on Contractor-Initiated Changes to the Authorization Basis, RL/REG-97-13, Revision 10, Department of Energy, December 2003.

<sup>3</sup> BNI letter from J. P. Henschel to R. J. Schepens, ORP, "Transmittal for Approval: Authorization Basis Amendment Request 24590-WTP-SE-ENS-04-0105, Revision 0, 'Safety Evaluation for Addition of a Preventative Control Associated with Plugging of the LAW Catalytic Oxidizer/Reducer Unit'," CCN: 094053, dated September 13, 2004.

### 3.0 EVALUATION – GENERAL DESIGN CHANGES

#### 3.1 General Description and Evaluation of Proposed Changes:

During the Contractor's LAW Melter Offgas hazard study (CCN: 065647) the need was identified to change the manual maintenance bypass valves for the chemical cleanup equipment in the Secondary Offgas System (i.e., mercury mitigation skid, catalytic oxidizer/reducer unit skid, caustic scrubber) to automatic valves actuated on high differential pressure across the equipment/skids. This need was required to meet the identified safety functions. The proposed changes in ABAR 24590-WTP-SE-ENS-04-0105 involve the addition of the safety interlock on the catalytic oxidizer/reducer unit skid bypass valve actuated on detection of high differential pressure across the skid. The addition of the safety interlocks for the caustic scrubber was covered in 24590-WTP-SE-ENS-04-021 which has been approved, and the mercury mitigation skid is covered in 24590-WTP-SE-ENS-03-1261 which is under ORP review.

The proposed change to add a safety interlock on the catalytic oxidizer/reducer unit skid bypass valve actuated on detection of high differential pressure across the skid is a change to how the LAW Melter Offgas system meets its safety function of maintaining offgas flow to the stack and preventing pressurization of the melter, and for this reason this change was submitted to ORP as an ABAR.

Evaluation (acceptable): No new Design Basis Events (DBE) were identified by ORP reviewers as a result of addition of the safety interlocks. The change proposes adding a preventative control to an existing DBE (offgas release), but does not create any new hazards requiring an iteration of the design basis event selection process. The likelihood of a plugging event in a component on the catalytic oxidizer/reducer unit skid is not affected by the addition of the proposed control. The safety interlock to automatically open the skid bypass valve on detection of high differential pressure across the skid will continue to maintain the flow of offgas to the stack, thereby preventing the melter from pressurizing. Therefore, the unmitigated and mitigated consequences are not affected by the proposed control addition.

The safety function of the melter offgas treatment system is for containment of NO<sub>x</sub> concentrated offgas and for directing the offgas flow to the stack. The proposed change of adding a safety interlock on the catalytic oxidizer/reducer unit skid bypass valve to automatically open on detection of high differential pressure across the skid does not alter this function; therefore, adequate safety is provided.

### 4.0 EVALUATION – SPECIFIC CHANGES TO LAW PSAR, REVISION 1

#### 4.1 Proposed Revised Text – Section 3.3, "Hazard Analysis":

The second paragraph under the subsection "Identification of Control Strategies" has been modified as follows (new text underlined):

"A number of control strategies have been identified to meet exposure standards for receptors outside the facility (and in some cases, those controls also serve to protect the

facility worker). The SBS level instrumentation is interlocked to shut off the SBS purge pump on detection of low SBS level. The catalytic oxidizer/reducer unit skid bypass valve is opened automatically on detection of high differential pressure across the skid. The caustic scrubbing solution recirculation pumps are automatically stopped, the caustic scrubber bypass valve is automatically opened, and the caustic scrubber spray water addition control valve is automatically closed on detection of high differential pressure across the caustic scrubber. Melter feed is terminated by interlock at a predetermined high differential pressure setpoint across the first bank of offgas HEPA filters. Melter feed is also terminated by interlock at a predetermined melter pressure. Similarly, steam/plant service air/demineralized water flow to the melter film cooler will be isolated by interlock at a predetermined melter pressure.”

In the above text ORP reviewers replaced “actuated” with “automatically opened” and “isolated” with “automatically closed” to add clarity.

Evaluation (acceptable, as modified): This section identifies control strategies. The change is consistent with the changes described and evaluated in Section 3.1 above.

#### 4.2 Proposed Revised Text – Section 3.4.1.1, “Melter Offgas Release”:

In the subsection “Melter offgas treatment system components” the following text has been added:

“Catalytic Oxidizer/Reducer Unit

- Catalytic oxidizer/reducer unit skid bypass valve will automatically open on detection of high differential pressure across the skid.”

In the above text ORP reviewers replaced “actuated” with “automatically opened” to add clarity.

Evaluation (acceptable, as modified): This section identifies melter offgas treatment system components. The change is consistent with the changes described and evaluated in Section 3.1 above.

#### 4.3 Proposed Revised Text – Section 4.4.2.1, “Credited Safety Function”:

The last bullet of this section has been modified as follows (new text underlined):

“SBS and WESP liquid level interlocks isolate sources of liquid addition into these vessels when high liquid levels are detected. This prevents flooding of the vessels, which would block the flow of offgas. A catalytic oxidizer/reducer unit skid differential pressure interlock automatically opens a bypass valve when high differential pressure is detected, preventing blockage of offgas flow. A caustic scrubber differential pressure interlock isolates sources of liquid addition into this vessel and actuates a bypass when high differential pressure is detected, preventing blockage of offgas flow. An additional interlock prevents inadvertent emptying of the SBS, which would create a preferred flow path that could prevent venting the other operating melter. (These functions are

addressed in this chapter under the appropriate melter offgas system component. They are therefore not discussed further in the melter offgas section.)”

In the above text ORP reviewers replaced “actuated” with “automatically opens” to add clarity.

Evaluation (acceptable, as modified): This section identifies the credited safety functions for the identified control strategies. The change is consistent with the changes described and evaluated in Section 3.1 above.

4.4 Proposed Revised Text – Section 4.4.5, “Catalytic Oxidizer/Reducer Unit Interlocks and Associated Components”:

Following is a new subsection of Section 4.4. Section 4.4 provides detailed descriptions of Safety Significant structures, systems, and components (SSC):

**“Catalytic Oxidizer/Reducer Unit Interlocks and Associated Components  
Credited Safety Function**

The catalytic oxidizer/reducer unit differential pressure instrumentation and related components/interlocks (e.g., valves, valve actuators) are considered Safety Design Significant (SDS) to support the following credited safety function:

- The catalytic oxidizer/reducer unit skid differential pressure interlocks automatically opens the catalytic oxidizer/reducer unit skid bypass valve to maintain the offgas system flow capability if the differential pressure across the skid increases to a predetermined setpoint (section 3.4.1.1). This safety function ensures the melter offgas system flowpath is maintained if a component on the catalytic oxidizer/reducer unit skid begins to be plugged thereby preventing a subsequent melter offgas pressurization and release whenever any melter is operating.

**System Description**

The catalytic oxidizer/reducer unit skid is described in section 2.5.

**Functional Requirements**

To prevent restriction of the melter offgas flowpath and subsequent pressure rise in the melter, the following functional requirements must be met (section 3.4.1.1) whenever any melter is operating.

- The catalytic oxidizer/reducer unit skid differential pressure detection instrumentation must monitor differential pressures across the skid and provide an open signal to the catalytic oxidizer/reducer unit skid bypass valve interlock when high differential pressure is detected.
- The catalytic oxidizer/reducer unit skid bypass valve interlock must open the catalytic oxidizer/reducer unit skid bypass valve on detection of high differential pressure across the skid, whenever any melter is operating. This safety function will open the bypass valve to maintain an unrestricted flowpath for the offgas.



Based on natural phenomena and confinement considerations, the offgas system will be SC-III. The remaining natural phenomena design requirements do not apply to this component, since it is protected from these other events by the facility structure. SDS SSCs must meet quality requirements in accordance with 24590-WTP-PSAR-ESH-01-002-01, Chapter 4.

### **Standards**

ISA S84.01 applies to the design for the catalytic oxidizer/reducer unit skid instrumentation and interlocks. IEEE 338 will be used in designing the safety systems so they can be tested to prove the required safety functions. IEEE 1023 (tailored) is used for all safety functions that require indication or alarm functions at a safety qualified operator interface.

### **System Evaluation**

To prevent blockage of the melter offgas flow path, certain aspects of the instrumentation system are ITS, classified as SDS, including the differential pressure across the skid.

A differential pressure safety instrumented system will measure the differential pressure across the catalytic oxidizer/reducer unit skid, transmitting the signal to the PPJ system. When the differential pressure rises above a predetermined setpoint, the PPJ will actuate the catalytic oxidizer/reducer unit skid bypass valve.

### **Controls Related to TSRs**

To prevent restriction of the melter offgas flowpath and subsequent pressure rise in the melter, the following controls must be applied at the TSR level.

- Catalytic oxidizer/reducer unit skid differential pressure instrumentation must be periodically calibrated.
- Catalytic oxidizer/reducer unit skid bypass valve must be periodically functionally checked.
- Catalytic oxidizer/reducer unit skid bypass valve interlock must be periodically functionally checked.
- Catalytic oxidizer/reducer unit skid bypass line must be periodically checked to verify open flow path.”

In the above text ORP reviewers replaced “actuated” with “automatically opens”, “activation signal” with “open signal”, “actuate” with “open” and “forces” with “phenomena” to add clarity.

Evaluation (acceptable, as modified): This section identifies the catalytic oxidizer/reducer unit interlocks and associated components as SDS Systems, SSCs. The change is consistent with the changes described and evaluated in Section 3.1 above. The components are appropriately categorized as SDS because the Secondary Offgas system is categorized as Safety Design Class (SDC) and Safety Requirements Document (SRD) Safety Criterion 1.0-6 requires that SDS SSCs are those whose failure would directly prevent a SDC SSCs from performing their safety function. The components are appropriately categorized as Seismic Category-III (SC-III)

because SRD Safety Criterion 4.1-3 requires that SDS SSCs that do not adversely affect the NPH safety function of an SDC SSC be designated SC-III. The standards identified are acceptable because they are standards identified as Implementing Codes and Standards (IC&S) for the corresponding SRD safety criteria, namely, ISA S84.01 is an IC&S for Safety Criterion 4.3-4, IEEE 338 is an IC&S for Safety Criterion 4.3-3 and IEEE 1023 is an IC&S for Safety Criterion 4.3-6. The controls related to Technical Safety Requirements identified by the contractor are appropriate as they include the valves, lines, instrumentation, and interlocks.

#### 4.5 Proposed Revised Text – Appendix 4A, “Table 4A-2”:

The following two rows have been added to the table:

**Table 4A-2 Safety Design Significant Structures, Systems, and Components  
Summary for LAW**

<b>Safety Design Significant Structure, System, or Component</b>	<b>Credited Safety Function</b>	<b>Representative and Bounding Accident (Chapter 3)</b>	<b>Controls (Chapter 5)</b>
Catalytic oxidizer/reducer unit differential pressure instrumentation Section 4.4.5	Monitor differential pressure across the catalytic oxidizer/reducer unit skid. On detection of high differential pressure provide activation signal to the catalytic oxidizer/reducer unit skid bypass valve interlock.	Melter Offgas Release (section 3.4.1.1)	Catalytic oxidizer/reducer unit skid differential pressure instrumentation must be operable whenever any melter is operating.
Catalytic oxidizer/reducer unit skid bypass valve and interlock Section 4.4.5	Actuate bypass valve to maintain the offgas system flow capability if the differential pressure across the catalytic oxidizer/reducer unit skid increases to a predetermined setpoint due to plugging of components on the skid.	Melter Offgas Release (section 3.4.1.1)	Catalytic oxidizer/reducer unit skid bypass valve interlock shall be operational whenever any melter is operating.

Evaluation (acceptable): This table identifies SDS items. The change is consistent with the changes described and evaluated in Section 3.1 and 4.4 above.

#### 4.6 Proposed Revised Text – Section 5.5.4, “LCO – Catalytic Oxidizer/Reducer Unit Interlock and Associated Components Operability”:

Following is a new subsection of Section 5.5. Section 5.5 provides technical safety requirements derivation:

##### **“LCO - Catalytic Oxidizer/Reducer Unit Interlock and Associated Components Operability**

**Purpose.** This control, to ensure catalytic oxidizer/reducer unit interlock operability, is derived from the melter offgas release accident (section 3.4.1.1). Without controls, the release of melter offgas may exceed the chemical exposure standards for both the facility worker and the co-located worker. The operation of the catalytic oxidizer/reducer unit



skid differential pressure monitor and bypass valve interlock maintains an open flowpath from the melter to the exhaust stack. Drawing flow from the melter through the melter offgas system prevents facility worker exposure to the chemical release. Elevated releases from the exhaust stack have been demonstrated (Chapter 3) to meet the chemical exposure standards for the co-located worker.

The catalytic oxidizer/reducer unit controls consist of operability requirements with the following elements:

- The catalytic oxidizer/reducer unit skid differential pressure monitoring instrumentation shall be operable, providing a signal to the catalytic oxidizer/reducer unit skid bypass valve interlock when the differential pressure across the skid exceeds a predetermined value.
- The catalytic oxidizer/reducer unit skid bypass valve and interlock shall be operable, and shall actuate the catalytic oxidizer/reducer unit skid bypass valve upon receiving a signal from the catalytic oxidizer/reducer unit skid differential pressure monitoring instrumentation.

Plugging of components on the catalytic oxidizer/reducer unit skid block the release path of the melter offgas system. The differential pressure monitoring instrumentation will provide an actuation signal to the catalytic oxidizer/reducer unit skid bypass valve interlock to maintain the melter offgas system flowpath if the flow through the skid becomes restricted.

Surveillances related to this LCO include functional tests of the catalytic oxidizer/reducer unit skid bypass interlock and valve, as well as the bypass line, to ensure they operate properly to maintain the offgas flow path. In addition, periodic loop calibrations of the differential pressure instrumentation are required to protect the melter offgas safety function.

These controls apply to the LAW facility in the operation mode, whenever any melter is in a state of operation. When no melters are in a state of operation, there are no cold caps, and no melter offgas release of NO<sub>x</sub> above exposure standards is possible.

**Derivation Criteria.** This control was selected to prevent exposures to the facility worker and mitigate exposures to the co-located worker (within the SRD chemical exposure standards) related to melter offgas releases.”

Evaluation (acceptable): This section identifies the operability requirements for the catalytic oxidizer/reducer unit interlocks and associated components as SDS SSCs. The change is consistent with the changes described and evaluated in Sections 3.1 and 4.4 above. The change is acceptable because the operability requirements identified by the contractor are appropriate as they include the valves, instrumentation, and interlocks. In addition, there are surveillance requirements related to these items as well as including the associated lines.

#### 4.7 Minor Editorial Changes:

Minor editorial changes were proposed for Table 5A-1 for consistency with other parts of the ABAR.

Evaluation (acceptable): These editorial changes are acceptable because they do not affect the safety basis described in the document and add consistency.

### 5.0 CONCLUSIONS

On the basis of the considerations described above, the ORP has concluded there is reasonable assurance that the health and safety of the public, the workers and the environment will not be adversely affected by the changes proposed by ABAR 24590-WTP-SE-ENS-04-0105, Revision 0. The proposed changes do not constitute a significant reduction in commitment or effectiveness relative to the design, construction, and operation of Important to Safety SSCs. Accordingly, the proposed changes, as modified, are acceptable and the ORP approves the general design change and interim-approves the specific PSAR changes as proposed in 24590-WTP-SE-ENS-04-0105, Revision 0.